The opinion in support of the decision being entered today was **not** written for publication and is **not** binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ROGER R. LESIEUR, CHRISTOPHER TEELING, JOSEPH J. SANGIOVANNI, LAURENCE R. BOEDEKER, ZISSIS A. DARDAS, HE HUANG, JIAN SUN, XIA TANG, and LOUIS J. SPADACCINI

Appeal No. 2004-1797
Application No. 10/042,056

ON BRIEF

Before PAK, WALTZ, and DELMENDO, Administrative Patent Judges.

WALTZ, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on an appeal from the primary examiner's final rejection of claims 1 through 11 and 20 through 25, which are the only claims remaining in this application. We have jurisdiction pursuant to 35 U.S.C. § 134.

According to appellants, the invention is directed to a method for removing substantially all of the sulfur present in an undiluted oxygenated hydrocarbon fuel stock supply which contains an oxygenate by passing this fuel through a desulfurizer bed

containing a nickel reactant (Brief, page 1). Appellants have stated that the claims do not stand or fall together and have presented reasonably specific, substantive arguments for the separate patentability of the six groups of claims (Brief, page 2).[1] Accordingly, we consider representative claims from each group to the extent appellants have presented separate arguments. See 37 CFR § 1.192(c)(7)(2002); *In re McDaniel*, 293 F.3d 1379, 1383, 63 USPQ2d 1462, 1465 (Fed. Cir. 2002). Representative independent claim 1 is reproduced below:

> 1. A method for desulfurizing a hydrocarbon fuel stream so as to convert the hydrocarbon fuel stream into a low sulfur content fuel, which low sulfur content fuel is suitable for use in a fuel processing section in a fuel cell power plant, said method comprising the steps of:
>
> a) providing a nickel reactant desulfurization station which is operative to convert sulfur contained in organic sulfur compounds contained in the fuel stream to nickel sulfide;
>
> b) introducing a hydrocarbon fuel stream which contains an oxygenate into said nickel reactant desulfurization station; and
>
> c) said oxygenate being present in said fuel stream in an amount which is effective to provide an effluent fuel stream at an exit end of said nickel reactant station which effluent fuel stream contains no more than about 0.05 ppm sulfur by weight.

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[1]Appellants contest the examiner's statement that the Brief does not include a statement that the claims do not stand or fall together (Reply Brief, page 1). However, we construe the examiner's statement as meaning that reasons have been presented for the separate patentability of each of the six groups of claims but the claims *within* each group stand or fall together (Answer, page 2, ¶(7)).

The examiner has relied upon the following references as evidence of obviousness:

Setzer et al. (Setzer)	3,485,746	Dec. 23, 1969
Alexander et al. (Alexander)	6,103,103 (effective filing date Jul. 5, 1994)	Aug. 15, 2000

The following rejections are before us for review in this appeal:

(1) claims 1-8 and 20-25 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Setzer (Answer, page 3); and

(2) claims 9-11 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Setzer in view of Alexander (Answer, page 5).[2]

We *affirm* all of the rejections on appeal essentially for the reasons stated in the Answer and those reasons set forth below.

OPINION

A. The Rejection over Setzer alone

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[2]The three obviousness-type double patenting rejections made by the examiner in the final Office action dated July 14, 2003, have not been repeated in the Answer although appellants have not contested these rejections (Brief, page 3). We consider rejections not repeated in the Answer to have been withdrawn. *See Paperless Accounting v. Bay Area Rapid Transit Sys.*, 804 F.2d 659, 663, 231 USPQ 649, 652 (Fed. Cir. 1986). In the event of further or continuing prosecution of this application, the examiner should consider repeating these rejections, as well as considering the patentability of the claimed subject matter in view of U.S. Patent No. 6,129,835 (see claims 5-8).

The examiner finds that Setzer discloses a process for desulfurizing a hydrocarbon fuel containing organic sulfur compounds by adding water (steam) to the fuel and contacting this mixture with nickel metal at a temperature of 500-900°F to convert the nickel metal to nickel sulfide (Answer, page 3). The examiner also finds that Setzer teaches that oxygen from the decomposition of the steam forms a protective layer on the nickel particles, thereby preventing undesirable coke formation in the nickel bed (*id.*).

With respect to the rejection of claims 1-8, the examiner recognizes that the only difference between Setzer and the claimed subject matter is the claimed recitation that the oxygenate is present in amounts such as to produce an exit stream with no more than about 0.05 parts per million (ppm) sulfur by weight (Answer, page 4).[3] The examiner concludes that it would have been obvious to one of ordinary skill in this art to practice the known desulfurization process of Setzer to attain any desired level of desulfurization since Setzer teaches the method is capable of removing sulfur in "trace" amounts (*id.*).

[3]The examiner also notes three other differences between Setzer and the claimed subject matter (Answer, page 4). However, since these "differences" relate to dependent claims 20-25, we will discuss these differences *infra*.

Appellants argue that a "trace" amount of sulfur in Setzer is less than 20 ppm, and that amounts of sulfur below this amount are not detectable by the Setzer system (Brief, pages 3-4). Appellants argue that the examiner bears the burden of proof on this question and should point out what parameters in Setzer should be varied by one of ordinary skill in the art to achieve the claimed less than 0.05 ppm sulfur (*id.*; see the Reply Brief, page 2).

Appellants' arguments are not persuasive. We find that Setzer teaches that "even trace amounts of sulfur" may cause a serious degradation in a fuel cell system (col. 1, ll. 21-25) and thus the desulfurization process for hydrocarbon fuels must be "essentially completely efficient in the sulfur removal sense." (Col. 2, ll. 1-4). Although Setzer discloses that "[b]reakthrough was considered to have occurred when detectable sulfur in the fuel condensate was found, usually at about 20 parts per million sulfur," this teaching does not preclude and in fact suggests that the process operates at lower sulfur amounts in the exit stream *before* breakthrough (col. 3, ll. 14-16). Additionally, we note that the amounts of sulfur exiting in the fuel condensate stream in Setzer are for *one* particular fuel (JP-4), at *one* particular pressure and temperature, when the fuel has

been doped with *large* amounts of *the most difficult organic sulfur compound to remove* (i.e., about 400 ppm of thiophenes; see col. 2, ll. 35-64; and col. 3, ll. 20-26). We also note that sulfide removal can be accomplished 5 or 7 times as readily as the thiophene removal (col. 3, ll. 20-26). Accordingly, we determine that the amount of sulfur removal would have been a result effective variable, as one of ordinary skill in this art would have reasonably recognized that the amount of sulfur removed would have depended on the amount of sulfur introduced with the fuel, the type of organic sulfur compound to be removed, and the removal conditions (temperature, pressure, fuel type, amount of water/hydrogen added). *See In re Woodruff,* 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990). We note that appellants have not argued nor submitted any objective evidence of unexpected results.

With regard to the rejection of claims 20 and 21, the examiner finds that the disclosed lower end of the temperature range in Setzer (500 °F.) is "close enough" to the claimed upper limit of temperature (450 °F.) that one of ordinary skill in the art would have expected similar results (Answer, page 4). Appellants argue that Figure 2 of Setzer indicates that it would not be desirable to utilize an operating temperature which is

below 500 °F. and the breakthrough time would appear to be at zero hours before reaching an operating temperature of 450 °F. (Brief, page 6).

Appellants' arguments are not well taken. We note that when the prior art discloses a range reasonably similar or close to the claimed range, *prima facie* obviousness is established due to the expectation of similar results for similar ranges. *See Titanium Metals Corp. of America v. Banner,* 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Furthermore, on this record, we determine that extrapolation of the graph in Figure 2 of Setzer reasonably would have suggested that operating temperatures of 450 °F. would have produced successful results, i.e., breakthrough times of about 4 hours.[4] Although this breakthrough time would not be the optimum, the test for obviousness is what the teachings and disclosures of the prior art would have suggested to one of ordinary skill in the art, even including unpreferred embodiments. *See In re Lamberti,* 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976).

[4]Contrary to appellants' argument, we determine that the extrapolated graph intersects the x-axis (at zero breakthrough time) at approximately 410 °F. Appellants have not submitted any objective evidence that this extrapolated graph would reach zero breakthrough time at *greater* than 450 °F.

With respect to the rejection of claims 20-21 and 22-25, the examiner finds it would have been obvious to utilize water obtained from any source, including a recycle from a selective oxidizer output, in the process of Setzer (Answer, page 5). Appellants argue that the selective oxidizer recycle must include both water and hydrogen and Setzer provides no motivation or suggestion that a selective oxidizer effluent could be used as the source (Brief, page 7; Reply Brief, page 2).

Appellants' argument is not persuasive. We determine that Setzer teaches the advantageous addition of both hydrogen and water (steam) to the desulfurization process, including self-generated hydrogen in the early stages of the reaction (col. 1, ll. 62-72; col. 3, ll. 6-14; and col. 3, ll. 63-66). Accordingly, we agree with the examiner that the addition of water and hydrogen from any source would have been well within the ordinary skill in this art.[5]

[5]We note that appellants have stated that claims 22-25 stand or fall together (Brief, page 2). Therefore, pursuant to the provisions of 37 CFR § 1.192(c)(7)(2000), we have selected claim 22 from this grouping and limit our consideration to this claim alone. Thus we do not address appellants' arguments concerning claims 23-25 (Brief, pages 7-8). We do note that the limitations of claims 23-25 have been previously addressed with respect to other claims above and by the examiner in the Answer.

For the foregoing reasons and those stated in the Answer, we determine that the examiner has presented a *prima facie* case of obviousness in view of the reference evidence. Based on the totality of the record, including due consideration of appellants' arguments, we determine that the preponderance of the evidence weighs most heavily in favor of obviousness within the meaning of section 103(a). Accordingly, we affirm the examiner's rejection of claims 1-8 and 20-25 under section 103(a) over Setzer.

B. The Rejection over Setzer and Alexander

The examiner incorporates the findings from Setzer as discussed above (Answer, page 5). The examiner recognizes that Setzer does not disclose or suggest alcohol or ether oxygenates which would form isobutylene and methanol products under the desulfurization conditions (*id.*). Therefore the examiner applies Alexander as evidence that conventional gasoline hydrocarbon fuels contain oxygenates including methanol, ethanol and methyl tertiary butyl ether (MTBE)(*id.*). From these findings, the examiner concludes that it would have been obvious to one of ordinary skill in this art at the time appellants' invention was made to treat a fuel containing oxygenates such as MTBE in the Setzer process (Answer, page 6).

In addition to appellants' prior arguments, appellants argue that Alexander teaches that there are many problems associated with the use of methanol and ethanol, and therefore the industry would not suggest the use of either of these two additives in gasoline (Brief, page 8). Furthermore, appellants argue that the use of MTBE as a gasoline additive has recently come under attack since there is evidence that MTBE is a cancer-causing agent (*id.*). Appellants argue that the examiner has not met the burden of showing that one desiring to desulfurize a gasoline would be motivated to use a fuel stock which includes an oxygenate (Brief, page 9).[6]

Appellants' arguments are not persuasive. On this record, appellants have not submitted any evidence that MTBE was banned *at the time their invention was made,* which is the time frame where obviousness must be established. Additionally, we note that appellants' specification teaches that "California Certified Gasoline" refers to a gasoline which contains about 11% by volume MTBE (the same amount of oxygenate used in appellants' examples; see the specification, page 4, third full paragraph; and pages 8-9, Figures 1-5, where MTBE is shown as a "conventional component

[6]Appellants present similar arguments for each of claims 9, 10 and 11 (Brief, pages 9-10).

of California Certified Gasoline"). We note that Alexander does not "teach away" from the use of methanol or ethanol but merely discloses some factors that "have dampened industry enthusiasm for these components." See col. 1, ll. 27-32. Furthermore, Alexander teaches that homologues of MTBE are also gaining industry acceptance (col. 1, ll. 34-36). Therefore we agree with the examiner that it would have been obvious to one of ordinary skill in this art at the time of appellants' invention to use the oxygenated fuel feedstock of Alexander in the process of Setzer, especially in view of the proposed reaction mechanism taught by Setzer (see col. 3, ll. 38-49).

For the foregoing reasons and those set forth in the Answer, we determine that the examiner has established a *prima facie* case of obviousness in view of the reference evidence. Based on the totality of the record, including due consideration of appellants' arguments, we determine that the preponderance of evidence weighs most heavily in favor of obviousness within the meaning of section 103(a). Accordingly, we affirm the rejection of claims 9-11 under section 103(a) over Setzer in view of Alexander.

C. Summary

We affirm all of the rejections on appeal. Accordingly, the decision of the examiner is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

Chung K. Pak
Administrative Patent Judge)
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Thomas A. Waltz)
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) APPEALS
) AND
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TAW/tdl

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